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**‘In no one Thing, they saw, agreeing’: Communicating Experimental Philosophy in Cowley
and Butler**

[T]he truth is we want good Poets (I mean we have but few) who have purposely treated of solid and learned, that is, Natural Matters (the most part indulging to the weakness of the world, and feeding it either with the follies of Love, or with the Fables of gods and heroes) ...

(Cowley 1661: 46-7)

I acknowledge that we ought to have a great Dread of their Power: I confess I believe that *new Philosophy* need not (as *Caesar*) fear the pale and melancholy, as much as the humorous and the merry: For they perhaps by making it ridiculous because it is *new* ... may do it more Injury than all the Arguments of our severe and frowning and dogmatical *Adversaries*.

(Sprat 1667: 417)

For those engaged in experimental philosophy during the Restoration, wit and poetry presented a threat and a promise. Developments in science were radically re-evaluating familiar ideas of nature and knowledge, and this generated equal measures of fascination and bafflement among the public.¹ The natural philosophy being undertaken by experimental pioneers was almost entirely new and strange to the community at large. According to Steven Shapin, ‘The categories of knowledge and their generation that seem to

¹ I follow Michael Hunter’s practice in using ‘science’ to stand for ‘natural philosophy’ or ‘experimental philosophy’ ‘for convenience, to avoid constant recourse to more cumbersome words’ despite their potentially ‘anachronistic overtones’ (1981: 8).

us self-evident and unproblematic were neither self-evident nor unproblematic in the 1660s'; in fact, for 'Restoration England there was no one solution to the problem of knowledge which commanded universal assent. The technology of producing knowledge had to be built, exemplified and defended against attack.... The foundations of knowledge were not merely matters for philosophers' reflections; they had to be constructed and the propriety of their foundational status had to be argued' (1984: 482). Part of the process of establishing the legitimacy of experimental philosophy was gaining support among a potentially sceptical public, and the poetry of the period was perceived by some as well positioned to contribute to this effort. The attitudes expressed in the passages above from Cowley and Sprat, both advocates of the new science, encapsulate two forms of this problem of establishing and communicating the proper foundations: first, hope that the knowledge being revealed might find champions among the poets to encourage interest, engagement and understanding; and, second, fear that science might be mocked out of existence by the barbs of the wits and satirists.

As has frequently been noted by historians, the formation of The Royal Society in the immediate aftermath of the Restoration acted as a focus for debates about the nature of scientific enquiry. Originating with the plan to form a 'College for the Promoting of Physico-Mathematical Experimental Learning' at a meeting that followed a lecture by Christopher Wren at Gresham College in London on 28 November 1660, it was granted Royal charters on 15 July 1662 and 23 April 1663, the latter formally naming it 'The Royal Society of London for the Improvement of Natural Knowledge'. Although far from being the only location where experimental and natural philosophical work was being undertaken, the Society's chartered status made it the public face of the new science and, hence, the chief target for interest, understanding and criticism from the broader lay public.

Despite its formal incorporation and the prestige associated with Royal patronage, the Society's early years were precarious both financially and in terms of public esteem. Charles II's attitude, although indulgent, was often amused: Samuel Pepys' diary for 1 February 1664 reports that 'Gresham College he mightily laughed at for spending time only in weighing of ayre, and doing nothing else since they sat' (v, 33), and the visiting Italian Count Lorenzo Magalotti records the king referring to them either as 'my ferrets' or 'my fools'.² Hunter asserts that natural philosophy 'became a rather superficial courtly fashion in the 1660s – while the royal entourage was at Salisbury during the plague in 1665, for instance, evenings were whiled away with lectures by Sir William Petty and others "upon something that nobody understands but themselves" Fellows were said to come to meetings "only as to a Play to amuse themselves for an hour or so".' (1982: 10). Quentin Skinner goes further by claiming, quite unequivocally, that the Royal Society was 'not the conscious centre of all genuinely scientific endeavour, but something much more like a gentleman's club' (238). Establishing the Royal Society as a public institution, and building the foundations of scientific legitimacy more generally, was not a smooth and seamless process of simply revealing natural philosophy's unquestionable truth to an avidly awaiting populace, but was instead a proselytising struggle undertaken to win over a sceptical and, at times, dismissive public to radically new and strange ways of understanding the natural world.

The Society's public status certainly contributed to making scientific enquiry an object of interest in Restoration society, albeit not always in a positive manner: the new science and its propagators found themselves subjects for court intrigue, fashionable

² The exact epithet used in the Count's report of Charles' remarks is explored in Knowles Middleton, pp. 13-16.

discussion, literary production and scurrilous gossip. Gentlemen became amateur scientists, conducting experiments, building collections and publishing papers almost as hobbies in their spare time, and earning the name of 'virtuoso' in contemporary parlance.³ At a moment when many of what are now understood to be central conceptual categories of scientific exploration were being established for the first time, fashionable interest generated by the Royal Society thus played an important role in framing such definitions and shaping the perception of science's place in society. It is around the experimental innovations and public image of the Society, then, that the potential influence of literary writing in shaping the development of science is greatest.

Shapin and Simon Shaffer's *Leviathan and the Air-Pump* (1985) emphasises the novelty of experimental philosophy in the period, and the sheer newness of what was being undertaken indicates the challenge issued to public perception: 'English experimentalists ... took the view that all that could be expected of physical knowledge was "probability", thus breaking down the radical distinction between "knowledge" and "opinion".' (24)

Experiments produced and tested hypotheses about the world that remained subject to revision or disproof by further experiment. What legitimised knowledge was consensus between observers that repetition of an experiment would invariably achieve the same result and thereby establish what had been observed as a 'fact'. At the heart of science, then, lay 'matters of fact', which must be

³ For precise definition of the term 'virtuoso', see Houghton (1942). Houghton is careful to differentiate amateur virtuosos from professional scientists and, although useful for definitional purposes, tends to overstate the clarity of the distinction in the period. Writers, especially satirists (including Butler in 'The Elephant in the Moon'), generally used the term to label anyone associated with experimental philosophy.

established by the aggregation of individuals' *beliefs*.... An experience, even of a rigidly controlled experimental performance, that one man alone witnessed was not adequate to make a matter of fact. If that experience could be extended to many, and in principle to all men, then the result could be constituted as a matter of fact. In this way, the matter of fact is to be seen as both an epistemological and a social category. The foundational item of experimental knowledge, and of what counted as properly grounded knowledge generally, was an artefact of communication and of whatever social forms were deemed necessary to sustain and enhance communication. (25)

Facts formed the core of the new science, and were produced and confirmed by the communication of the shared experience of legitimate witnesses.⁴ Barbara J. Shapiro's *A Culture of Fact* expands on this idea, arguing persuasively that this conception of the 'matter of fact' as fundamental to scientific study was drawn from developments in legal theory at the beginning of the seventeenth century and that, just as with 'legal facts, "scientific facts" would be evaluated on the basis of a set of legally derived criteria of credibility, such as opportunity, ability, probity, skill, fidelity, status, experience, and reputation', and that such criteria, 'taken over by the naturalists when they adopted the concept of matters of fact, help explain the law-laden language of the virtuosi and their emphasis on witnessing, impartiality, and cautiousness about going beyond well-proven facts.' (112)⁵ The language, means and contexts of communication are, therefore, crucial to the production of knowledge in late seventeenth-century natural philosophy: experimental results become

⁴ For a persuasive discussion of the new science's witnessing as a form of theatre, see Shanahan (2009).

⁵ As I shall attempt to argue in the final section, the problems of credibility and impartiality in witnessing lie at the heart of Butler's satire in 'The Elephant in the Moon'.

facts through shared witnessing, either directly or by means of clear and direct communication of information about them to make possible a 'virtual witnessing' (Shapin and Shaffer, 60) on the part of those not physically present. This places language and communication at the heart of science, and arguments about the possibility of 'telling truth' about the world shape the debates of the period.

The importance of communication was certainly perceived by scientists at the time. The idea that the transformation, even the purification, of scientific language could serve to make discourse clearer, more precise, and accessible to the widest possible public while simultaneously demonstrating probity and impartiality was of particular interest to some influential members of the Royal Society during the 1660s; and to this end, they enlisted the contributions of poets and critics. At a council meeting of the Royal Society on 7 December 1664, for example, a 'committee for improving the English language' was proposed with a membership including some of the most influential literary names of the period: Sir John Birkenhead, John Dryden, John Evelyn, Thomas Sprat, Sir Samuel Tuke and Edmund Waller, among others.⁶ Although this committee barely met (the outbreak of the Plague in 1665 is a key reason it disbanded quickly) and never published anything, that it was established and included such prominent writers indicates the centrality of the question of communication in the 1660s. Perhaps the closest the Society came to the goal of purifying language and enabling frictionless scientific communication was with the publication of John Wilkins' *An Essay towards a Real Character, and a Philosophical Language* (1668), which generated substantial interest at the time even though it had little lasting influence.⁷

⁶ Birch, *History*, 1.499-500. For more details, especially of Dryden's involvement, see Emerson (1921).

⁷ For an insightful discussion of the arguments of Wilkins' text, see Smith (2017).

Following on from writers such as Hunter, Shapin and Schaffer, significant work has been done by historians of science on the conflicts involved in the formation of scientific communication after the Restoration. The picture drawn by them is of a sustained intellectual dialogue between experimental scientists and those such as Thomas Hobbes, Henry Stubbe, Margaret Cavendish and the adherents of Scholasticism in the universities who resisted the innovations that were being made in the study of nature.⁸ Literary writing usually tends to be viewed in these studies as peripheral to the attempts to define experimental philosophy, and, when it is mentioned at all, is often discussed in terms of a particular author's allegiance with one or other faction or her or his satirical attacks on the personalities of individual scientists or scientists in general. Such personal satire is certainly an important element of the literary response to science, and their potential impact on public perception was clearly recognised at the time (as an example, Robert Hooke's furious response to Shadwell's *The Virtuoso* provides evidence of the perception that satire could put one's personal standing in jeopardy).⁹ To see this as the limit of literature's encounters with the new science, however, is to fail to examine the unique and original ways in which literary writing engages with natural philosophy. It also gives too little weight both to the precariousness of science in the public spaces of Restoration England and to literature's capacity to shape attitudes in ways that were perceived at the time to have the capacity to directly challenge science's development.

⁸ The most detailed account of these debates is provided in Shapin and Schaffer (1985), which focuses particularly on Hobbes. For the attack by Stubbe on the Royal Society, see Jacob (1983), pp. 78-109. Sarasohn (2010) provides an insightful and clear account of Cavendish's natural philosophy, which includes a persuasive discussion of her controversial 1667 visit to the Royal Society (pp. 25-33).

⁹ Hooke's diary for the day he saw the play (2 June 1676) reads, 'Damned Doggs. *Vindica me Deus*. People almost pointed', and even the following day he was acutely aware of those who 'Flauntingly smiled' on seeing him (235). For a discussion of Hooke's response, see Shanahan (2009), pp. 549-50.

More recently, critical explorations of the relationship between literature and science at the Restoration have begun to approach things differently. Rather than seeing the scientific revolution as just a context for literary writing or presenting poets and playwrights as simply laughing from the side-lines, critics have begun to examine the ways in which changes in literary and rhetorical techniques during the period actively engaged with and contributed to the formulation and transmission of natural philosophical ideas in an 'era when the activities of "*poet, philologist, antiquarian, historian, scientist, virtuoso*" were not yet segregated into distinct disciplines' (Gimelli Martin, 112). Juliet Cummins and David Burchell's collection of essays from 2007, *Science, Literature and Rhetoric in Early Modern England*, for example, presents a series of arguments that develop from the premise that 'relationships between words and things, the named and the unnamed, topics of argument and "matters of fact", were starting points for the new ways of presenting and understanding knowledge, and affected the developments of both the arts and the sciences' to the extent that, because 'rhetorical forms contributed to the development of science as a modern discipline' and the new scientific ideas formed the subject matter of much literary writing, 'early modern "literature" and "science" cannot always be sharply distinguished.'

(2) In a similar vein, Karen Bloom Gevirtz argues that there was no pre-established 'rhetoric for the new ideas of human capacity or for representing and performing new ideas of the act of knowing, including literary conventions or genres. Even if there were extant conventions or forms that could support or execute the values of the [natural] philosophical revolution, the combination of new pressures, new ideas, and new rhetorical needs rendered those existing forms problematic or even obsolete.' (1-2) On that basis, her study of *Women, the Novel, and Natural Philosophy, 1660-1727* explores the ways in which, especially in the hands of female writers, new narrative techniques that came to form the

modern novel as a literary genre interacted with (both drawing on and contributing to) developments in science, thereby producing a thoroughgoing philosophical revolution at the end of the seventeenth century. Margaret J.M. Ezell's recent chapter 'Creating Science' in her *The Oxford English Literary History* puts these ideas and approaches into action as she persuasively weaves discussions of Cowley's and Cavendish's literary responses to science into her readings of the rhetorical and argumentative structures of pieces by Boyle, Hooke, Wilkins and Newton to provide a nuanced account of the language of experimental philosophy in the period.¹⁰ This focus on literature and language in the period identifies the communicative challenges faced by the new scientists by recognising that the development of adequate rhetorical forms was not just an adjunct to empirical research but that questions of literary form lay right at the heart of the struggle to establish the new experimental philosophy.

The aim of this essay is to take two contrasting poetic texts and reads them as models that discuss the ways in which literary writing contributed to the development of experimental philosophy in the period by wrestling with this problem of communication and knowledge: first, Abraham Cowley's ode 'To the Royal Society' which presents a programmatic statement of the aims and values of the new science, but which risks falling into performative self-contradiction as its demands for a new and direct language appear to stand at odds with its own lexicon; and, second, Samuel Butler's 'The Elephant and the Moon' which satirises the practices and investments of scientists in response to a discovered 'fact' about the moon, and exhibits the challenges posed by self-interest and social standing to disinterested communication and objective knowledge in experimental philosophical discourse. Reading these poems together aims to begin to chart the interplay between linguistic, epistemological and social forms in the new natural philosophy of the

¹⁰ See Ezell (2017) pp. 169-184.

Restoration period, and thereby to illustrate the potential for poetic writing to shape public perception of and engagement with experimental science.

‘To the Royal Society’

Thomas Sprat published *The History of The Royal Society of London, for the Improvement of Natural Knowledge* in 1667. Designed to publicise the Society, it gives, as Hunter argues, ‘a full view of the aspirations of Restoration science’ (1981: 31). Rather than a record of achievement or a summary of an established or agreed-upon methodology, Sprat’s text strives to make a case for public acceptance: it emphasises science’s potential to contribute to the nation’s good in terms both of its discoveries, inventions and innovations, and as a model for social cooperation, consensus and harmony in the search for truth.¹¹

The poem that opens the *History* is Abraham Cowley’s ode ‘To the Royal Society’. Written at the behest of Sprat and prominent Society member John Evelyn, it celebrates the foundation of the Society as marking the culmination of a process of philosophical enlightenment beginning with the work of Francis Bacon. This has liberated ‘Philosophy’ from dogma, superstition and spurious ‘Authority’ as Bacon, ‘like *Moses*’, led knowledge to ‘the very Border ... Of the blest promis’d Land’ (93-6).¹² The Royal Society’s task is to claim this land for a renewed philosophy that will eschew the errors of the past and bring nature, ‘The real Object’ (87) of knowledge, into proper focus, securing it as the source for a rejuvenated human understanding and a more just social order.

Although there is no definitive record of Cowley joining the Society or attending meetings, and he seems at the very least to have been peripheral to its day-to-day work, he

¹¹ See Morgan (2009) for an insightful reading of the *History* in these terms.

¹² References will be by line number to the version printed in the 1667 edition of Sprat’s *History*.

was an obvious choice for a poet to celebrate its early history. A Royalist and supporter of the king, by the middle of the 1660s Cowley had become a recognised intellectual who had publicly acknowledged the influence of Baconian philosophy and published his own pro-science pamphlet, *A Proposition for the Advancement of Experimental Philosophy* (1661), which advocated founding an institution whose rationale bore clear resemblances to the soon to be chartered Society. Providing a base for experimentation, support for study, a forum for public discussion, and a college for educating experimental philosophers (this last ambition being beyond the scope of the actual Society), Cowley's projected academy had four objectives: 'first, to weigh, examine, and prove all things of Nature delivered to us by former ages, to detect, explode, and strike a censure through all false Monies with which the world has been paid and cheated so long.... Secondly, to recover the lost Inventions, and, as it were, Drown'd Lands of the Ancients. Thirdly, to improve all Arts which we now have; And lastly, to discover others which we yet have not' (57-8) in order that 'the popular and received Errours in Experimental Philosophy (with which, like Weeds in a neglected Garden it is now almost all overgrown) shall be evinced by tryal, and taken notice of in publick Lectures, that they may no longer abuse the credulous, and beget new ones by consequence or similitude.' (38) These resolutely Baconian aspirations are clearly and quite meticulously laid out in the pamphlet, which presents an argument for the intellectual and social benefits such a college might offer.

Although ambitious in scope and carefully worked out in practical terms, Robert Hinman is correct in asserting that 'Cowley's *Proposition* does not present an original view of knowledge', and that he 'was not the first Baconian to propose an institution for research in natural philosophy [as] Hartlib, Petty, Evelyn, and others had presented schemes for philosophical colleges or cooperative research ventures' (147). Despite this, though, the

essay was perceived by contemporaries as influential for the development of science in the 1660s: Sprat, in particular, acknowledges its importance for the foundation of the Society in his *History*, singling out the *Proposition* as a publication that ‘very much hasten’d its Contrivance’ (59). As well as this declared interest in the new philosophy, Cowley had also already explored science in poetic form: his 1662 Latin poem *Plantarum Libri Sex* presented a six-book botanical treatise that simultaneously examined how certain classical literary sources might aid the study of natural phenomena and explored Latin’s role as a language for the communication of scientific ideas.¹³

Taken together, the *Proposition*, *Plantarum Libri* and ‘To the Royal Society’ present an approach to finding a language and conceptual structure for scientific communication that define experimental philosophy in terms of a nuanced relation between it, religious faith and literary rhetoric. Cowley thus contributes to the same processes of definition and defence of the new philosophy that Hunter, Shapin and Shaffer identify in the work of practicing scientists: the ode, especially, develops a definition of the epistemology of experimental philosophy similar to (albeit in a different register from) such foundational texts as Boyle’s *New Experiments Physico-Mechanical, touching the Spring of the Air* (1660), *The Sceptical Chymist* (1661) and Hooke’s *Micrographia* (1665), and is worth analysing on that basis.

‘To the Royal Society’ defines knowledge in terms of its place in a relationship between nature, religion, traditional philosophy and art. Experimental philosophy, the poem asserts, must actively produce knowledge by interrogating natural objects rather than receiving ideas immediately in the manner of divine inspiration or applying pre-established

¹³ For an insightful study of the *Plantarum*, which includes an accurate and very helpful translation of the poem, see Spearing (2017).

categories drawn from tradition as was the case with arguments deriving from scholastic thought. And it must also, crucially, avoid the distractions of false rhetoric. Central to this, therefore, is the challenge of forming a language that will make possible the communication of actively constructed scientific knowledge.

The ode opens by personifying 'Philosophy' as 'the great and only Heir / Of all that human Knowledge which has bin / Unforfeited by Man's rebellious Sin' (1-3) who 'Has still been kept in Non-age till of late, / Nor manag'd or enjoy'd his vast Estate' (8-9): an innocent and naïve youth who, despite his 'Three or four thousand Years' (10), has been restrained from assuming his true role by 'Guardians and the Tutors' (14) who fear Philosophy's emancipation would end their own power and 'Authoritie' (18). The central rhetorical thrust of the opening stanza is thus a call for knowledge's emancipation from the shackles of 'Authoritie': the Baconian task is to set Philosophy free from the past and bring it to maturity so its rightful inheritance and 'Estate' can be claimed.

This 'Estate', access to the 'real Object' of knowledge, is presented in terms of direct reference to 'rebellious Sin' and the Fall in a manner that carefully delimits the bounds for scientific knowledge in terms of a relation between religion and philosophy, and sets out a programme for the development of the latter. It draws on Baconian thought by invoking what Joanna Picciotto describes as Bacon's identification of 'Eden as a place of knowledge and discovery' that 'provided a theodicy for the recently "fallen" senses':

Baconians ... turned this identification to account, using the innocent Adam to designate the expression of human potential under ideal conditions, conditions they worked hard to recreate. The intellectual hunger and restlessness once

identified with the fall now characterized a regimen of self-exertion whose aim was to *reverse* the fall. A theodicy had become a research program. (36-7)

In contrast to earlier accounts of poetry or theology that, as Peter Harrison succinctly puts it, 'represent nature as it ought to be rather than in its imperfect fallen condition, Bacon gave philosophy an active role in the restoration of nature to its prelapsarian perfection.'

(25) Such programmatic relating of philosophy to the active task of building towards a spiritual redemption of human knowledge, evident in the opening stanzas of the ode, works by refocusing thought directly on created nature and asserting that to understand the world is to draw closer to God. This is also a central assertion of Sprat's *History*: although the 'Employment' of the experimental philosopher 'is about *material Things* [...] so far from drawing him to oppose invisible *Beings*, it rather puts his Thoughts into an excellent good Capacity to believe them', and so he 'has always before his Eyes the *Beauty, Contrivance, and Order of God's Works*: From hence, he will learn to serve him with all Reverence' (348-9). Cowley's ode develops from the premise that direct focus on the material world is intrinsically spiritual to build an image of redemptive science in terms of a string of Biblical allusions and metaphors. Bacon appears as 'like *Moses*' who led our 'wandering Predecessors' beyond 'The barren Wilderness' so that knowledge could 'on the very Border stand / Of the blest promis'd Land' (89-97); and the Royal Society is imagined as "*Gideon's little Band*' (117): 'great Champions' who will conquer and convert 'spacious Countries but discover'd yet; / Countries where yet instead of Nature, we / Her images and Idols worship'd see' (109-12). 'To the Royal Society' thus frames experimental philosophy's claims to

knowledge within the rhetoric of redemptive promise that Picciotto identifies in scientific publications of figures such as Hooke, Glanvill and Boyle.¹⁴

The poem constructs its distinction between genuine knowledge and the distractions of the Guardians in terms of a description of perception that distinguishes between direct access to objects and the detours of artistic presentation; or, in alternative terms, a definition of what it means to see truly that is also an account of the differences between artistic deception, spiritual revelation and experimental knowing. Philosophy's Guardians have been deceiving and diverting with 'Sports of wanton Wit' (19): feeding with 'Des[s]erts of Poetry' and leading 'Into the pleasant Labyrinths of ever-fresh Discourse' (20-4), to the extent that 'The Riches' in 'Nature's endless Treasury' (26-7) are lost in the 'painted Scenes, and Pageants of the Brain' (30). Art – the 'Poetry', 'Wit' and 'painted Scenes' – obscures nature, drawing the eye and mind away from truth, and seducing the senses with mere 'Pageants'. Rhetoric and artistic representation are depicted as inherently dangerous: seductive deviations from approaching nature as it really is. By stanza four, this version of representation has become the chief problem for Bacon and his Royal Society followers to overcome:

From Words, which are but Pictures of the Thought,
(Though we our Thoughts from them perversly drew)
To Things, the Mind's right Object, he it brought:
Like foolish Birds to painted Grapes we flew;
He sought and gather'd for our Use the true; (69-73)

¹⁴ For examples of these rhetorics, see Picciotto (2001), pp 37-41.

Although ostensibly an attack on the textual analytics of scholastic method and the multiplying dialectical commentaries it developed from a limited range of foundational texts (thoughts ‘perversely’ drawn from the words of canonical authors), these lines evoke a much broader suspicion of representation: if the ‘right Object’ is to be approached, that approach must be direct and devoid of the distracting ‘painted Grapes’ drawn from traditional representational thinking. The stanza continues by declaring not only that ‘Who to the Life an exact Piece would make, / Must not from others Work a Copy take’ (79-80), but, and more fundamentally, ‘Much less content himself to make it like / Th’ Ideas and the Images which lye / In his own Fancy, or his Memory’ (82-4): it is not simply the direct reproduction of prior models that needs to be rejected, but the impressions, images and fancies those models might have created. The experimental philosopher must see the world anew, wresting representation free from the authority of tradition, in order to grasp the object as it is rather than as ‘Fancy’ or ‘Memory’ might have painted it. This explicitly reformulates the assertion in the *Proposition* that the experimentalist’s role is to ‘detect, explode, and strike a censure through all false Monies with which the world has been paid and cheated so long’ (57), and presents experimental knowing as an emancipation from the constraints of tradition that shape and limit experience. Reason, the *Proposition* argues, requires purification and discipline in the face of its objects:

Our Reasoning Faculty as well as Fancy, does but Dream, when it is not guided
by sensible Objects. We shall compound where Nature has divided, and divide
where Nature has compounded, and create nothing but either Deformed

Monsters, or at best pretty but impossible Mermaids. 'Tis like Painting by
Memory and Imagination which can never produce a Picture to the Life. (10)

In imagery that anticipates the lexical field employed in the ode, the *Proposition* presents the fancies and dreams of artistic representations not as alternative modes of address to nature but, rather, as its distortion into monsters. What is required for the new philosophy, therefore, is a new mode of representation, a new language in which the sensible object can be conveyed and a new relationship with nature made possible. Crucially, this cannot simply be a separate language for use only in the laboratory: Cowley's assertions of the traps and labyrinths rhetoric sets for memory, fancy and imagination implies the necessity that society in general must 'detect, explode and strike censure through' false rhetorics in order that the general witnessing necessary for the establishment of facts can occur objectively.

The ode attempts to suggest what such a language might be. Those who wish to perceive truly have only one avenue of approach: 'he before his Sight must place, / The natural and living Face; / The real Object must command, / Each Judgment of his Eye, and Motion of his Hand.' (85-8). Shorn of tradition, set free from the deceptions of art, experimental philosophy must be beholden only to the 'real Object' itself. And yet, despite the apparent rejections of art and internality, the solution Cowley offers to the threat of deception cannot be a matter of by-passing representation in favour of non-mediated knowledge, as such immediacy would be sacrilegious:

Yet still, methinks, we fain would be
Catching at the forbidden Tree,
We would be like the Deity,

When Truth and Falsehood, Good and Evil, we
Without the Senses Aid within our selves would see;
For 'tis God only who can find
All Nature in his Mind. (62-8)

As a block to the possibility of immediacy stands the fact of the Fall: absolute access to truth is the promise with which Satan seduces Eve, and, even if the aim is a Baconian 'restoration of nature to its prelapsarian perfection', the repetition of falling prey to such temptations must be resisted by the experimental philosopher. Instead, and this is the chief struggle to define experimental philosophy with which the poem wrestles, a new attitude to the world is necessary, and with that attitude a new language to frame modes of seeing that have the potential to reverse rather than repeat the Fall.

If the rhetorical structures of traditional thought have misled Philosophy, and the immediacy of revealed truth is the property of God and a subject for faith, scientific knowledge consists in training and refining the senses in relation to their objects, and this must occur by means of an ordering of language and communication. Sprat insists on this in an influential passage from his *History*:

Who can behold, without indignation, how many Mists and Uncertainties, these specious *Tropes* and *Figures* have brought on our Knowledge? [...] the only Remedy, that can be found for this *Extravagance*; and that has been a constant Resolution, [is] to reject all the Amplifications, Digressions, and Swellings of Style; to return back to the primitive Purity and Shortness [...] a close, naked,

natural way of Speaking; positive Expressions, clear Senses; a native easiness;
bringing all Things as near the mathematical Plainness as they can (112-3)

Representation is required, but the language in which it occurs must be disciplined. It is in attempting to resolve this tension between the sacrilegious claims of immediacy and the distracting deceptions of representational thinking that 'To the Royal Society' sets out its account of the epistemological basis of science, and gestures towards a language in which knowledge might be articulated.

At the heart of this lies activity: Philosophy labours to generate knowledge from its objects. Crucially, knowledge is something to be actively produced rather than passively received. In contrast to 'those many' who rest 'Idly extended on the Ground, / To drink with their dejected Head / The Stream, just so as by their Mouths it fled', experimental philosophers 'took the Waters up, / And made of their laborious Hands the Cup.' (124-9) Instead of passively accepting, the philosopher works on nature, experimenting upon its objects in the laboratory, testing, making and producing knowledge through the instruments of science. The fundamental aspect of the language of science is its ability actively to provoke and read a language from nature: 'You've learn'd to read her smallest Hand, / And well begun her deepest Sense to understand.' (149-50) Through innovations made by new scientific instruments (the ode celebrates the telescope and microscope in particular), experimental philosophy has 'learn'd to 'read' nature's 'sense', transforming the world into a text for knowledge. As a celebration of the Society's history, this achievement ought to form an ideal conclusion. However, two stanzas remain, and their focus on language makes explicit the unresolved tension at the poem's heart between sacrilegious immediacy and poetic deception. Opening with fear about the 'Laughter and Scorn' (152) of

the wits and moving on to provide an encomium to Sprat's style, which 'from all modern Follies ... / Has vindicated Eloquence and Wit' in a 'candid Stile' that is projected as a model for the new science as it 'H'as all the Beauties Nature can impart, / And all the comely Dress without the Paint of Art.' (177-187), the final stanzas celebrate language's purification. As these passages show, however, they do so in rhetoric loaded with the 'painted Grapes' the ode urges science to reject.

For James Anderson Winn, the poem ultimately fails and falls into self-contradiction on just these grounds: 'Cowley never worked his way clear of the fanciful "Westminster" style; the manner of his poem in praise of Baconian clarity entirely contradicts its matter' (1987: 132). This is a strong claim, but is, in a sense, correct: the poem's rhetorical devices are fundamentally at odds with the modes of representation it calls for. However, pragmatically this is less than the straightforwardly performative contradiction Winn decries: appearing at the head of Sprat's *History*, the poem plays the propaedeutic function of setting out principles to be adhered to and challenges to be faced in a language, the familiar poetic language of the period, that the full system of experimental philosophy's scientific thinking will come to purify once it is complete. In a discussion of Milton and the Royal Society, Catherine Gimelli Martin, makes a similar point: 'if in theory the Royal Society rhetoricians did desire a one-to-one correspondence between words and things; in practice they patiently resigned themselves to the inevitable slippage and metaphoricity of language, since the formulation of a truly scientific vocabulary lay far in the future.' (112)¹⁵ 'To the

¹⁵ Gimelli Martin goes on to Compare Cowley's rhetoric with Milton's, and argue that 'Ironically, then, the main difference between this apostle of the "naked rhetoric" and the "baroque" epic poet is that both Sprat and his friend Cowley often employ a more abstract metaphysical style than the increasingly plain style employed in Milton's latest poetry and prose.' (112). This is an intriguing suggestion, albeit one beyond the scope of this piece to explore; however, it is worth noting (as Gimelli Martin does) that after Cowley's death 'John Evelyn and John Beale invited Milton to consider becoming the new Poet Laureate of the Royal Society.' (98)

Royal Society' ends, then, like the Moses it invokes as a model for Bacon: at the borders of the 'blest promis'd Land' (96) but, as yet, unable to take that ultimate step into the purified vision of the new language for which it calls. And this is the linguistic space occupied by science throughout the period, a space that contemporary satire sets out to exploit.

'The Elephant in the Moon'

If 'To the Royal Society' appeals for a new scientific language without being able to demonstrate precisely what that language might look like, Samuel Butler's 'The Elephant in the Moon' presents experimental discourse as in danger either of falling prey to mutually reinforcing self-delusion or of becoming a cacophony of dissenting voices incapable of demonstrating anything, and thereby develops a critique of the drive to place impartiality, consensus and objectivity at the heart of natural philosophical communication. It deploys exactly the wit that Sprat claimed 'new *Philosophy*' 'ought to have a great Dread of' in a satire aimed at the foundations of scientific communication the *History of the Royal Society* was written to legitimise. The discovered 'fact' of the poem, an elephant revealed by a telescope pointed at the moon, becomes the focus for extended speculation from members of an eminently recognisable 'learn'd Society' (1) that throw into question the practices of disinterested knowledge generation championed by the Royal Society.¹⁶ Even after the elephant is discovered to be a mouse caught inside the telescope and the two warring moon-armies similarly trapped flies and gnats, the scientists continue their speculations upon and plans to profit from their discovery before eventually collapsing into mutual recrimination. Although diametrically opposed to Cowley's vision, 'The Elephant in the

¹⁶ Line references are to Gilfillan's edition of *The Poetical Works* (1854).

Moon' examines the same questions of knowledge, truth and communication, and reading the two poems together aims to make visible the contested spaces of language and fact that the new science generated.

Even less is certain about Butler's relation to the Royal Society than Cowley's, yet critics agree he was knowledgeable about developments taking place in Restoration science. Experimental philosophy plays a key role in *Hudibras*, his most influential poem, which includes an encounter between the protagonist and Sidrophel the astrologer that draws numerous (mainly disparaging) allusions to ideas associated with science and is appended by 'An Heroical Epistle of Hudibras to Sidrophel' that makes direct reference to the Royal Society and Sir Paul Neile, a founding member.¹⁷ Butler also composed a series of verse and prose 'characters' of scientific types such as 'The Virtuoso' and an abandoned poetic fragment, 'A Satire on the Royal Society', that takes aim at its experiments and innovations. Notebook entries collected in his *Prose Observations* indicate substantial knowledge of contemporary science and an attitude that, although sceptical, is less dismissive than might appear from the poetry.¹⁸ Also, in his *ODNB* entry, Hugh de Quehen asserts that Butler 'helped his friend Shadwell ... with the scientific parts of *The Virtuoso*', the most successful stage satire on science in the period. There are no details of membership of the Royal Society, although Marjorie Hope Nicholson suggests it is implied by his early familiarity with experiments with microscopes carried out there, and there is evidence of a journey to France undertaken with Sprat in the service of the Duke of Buckingham in 1670.¹⁹ Just as for

¹⁷ Sidrophel appears in Book 2, canto 3, first published in 1663, and the 'Heroical Epistle' is added in the revised edition of 1674. See Curtiss (1929) for a discussion of this. The satirical conflation of astrology with astronomy evident in Sidrophel is an important aspect of Aphra Behn's 1687 play *The Emperor of the Moon*.

¹⁸ Although critics are generally careful to acknowledge that the notebooks do not add up to a coherent philosophy, and many entries may have been intended as sketches for satire, they are often employed to explain Butler's attitudes – see, for example, Robinson (1983) and Horne (1983) for arguments in relation to 'The Elephant in the Moon'.

¹⁹ See Nicholson (1965), pp. 127-30; for details of the trip to France, see Bentley (1945).

many of his contemporaries, even in the absence of direct links to the Society, there is little doubt that science was a source of fascination for Butler.

Criticism of 'The Elephant in the Moon' has tended to focus either on dating its composition (it was first published posthumously in 1759 but probably written in the early 1670s) or identifying which members of the Royal Society are being satirised in each of the characters.²⁰ The first editor to publish the poem, Robert Thyer, claims it was 'intended by the Author for a Satyr upon the *Royal Society*, which, according to his Opinion, at least, ran too much at the Time into the *Virtuoso* Taste, and whimsical Fondness for surprising and wonderful Stories in natural History', and 'Sir *Paul Neale*' in particular as a 'conceited Virtuoso' (1). Carson S. Duncan expands upon this, seeing the poem explicitly as an act of personal revenge that 'was inspired by personal animosity towards Sir Paul Neal, who had persistently declared that Butler was not the author of *Hudibras*.' (115) And Bruun (1969) expands upon this to identify five targets, including also Brouncker, Boyle, Evelyn and Hooke, as speakers of the poem's more absurd and outrageous lines.

Critics who focus on the science itself tend to explore the nature of the failed experiment with the telescope rather than the characteristics of the dialogues between scientists and what these might say about the language of experimental verification. If, though, as Nicholson asserts, satire about telescopic mis-discoveries 'could have been – and often was – written nearly a half-century earlier' (1965: 127), it is the depiction of the scientists' debates that forms the most immediately contemporary satirical gesture in the poem. Bruun is dismissive of the dialogue, asserting that 'the style of the speeches has no individual distinction' (1969: 382) to capture the personality of particular speakers, but this

²⁰ Two essays by Sv. Bruun (1974 and 1969) provide the most authoritative responses to these matters.

is precisely the point: although there are witty digs at identifiable individuals that would have appealed to the satirical humour of a fashionable Restoration audience, the almost choric nature of the dialogue makes the target of satire experimental communication itself and the problems with the modes of discursive objectivity called for by Cowley, Sprat and the proselytising new scientists. This also challenges Horne's assertion that Butler 'focused his attacks more on bad scientists in particular than on science in general' (15), as what is satirised in the poem is the problem of impartiality and cautiousness within experimental philosophical communication more generally.

Antithetically to the invocation of disinterested objectivity in Cowley, Butler's virtuosos are resolutely worldly as each is introduced in terms of his public standing: the first speaker, for example, the '*Virtuoso* then in chief', is 'Approv'd the most profound and wise / To solve Impossibilities' (28-30), the next is 'a great Philosopher / Admir'd, and famous far and near' (61-2), and each in turn is identified in terms of public reputation. Their concerns throughout are with enhancing these reputations as means of self-advancement, and their language reflects their shared education and social standing as each new argument about the observed object is framed with gentlemanly references to classical sources. In fact, the poem insists, the whole process of generating knowledge is premised on the shared learning, social values and language of the Society members.

Bruun's lack of distinction is, therefore, no failure in characterisation; instead, the uniformity of voices produces an ongoing dialogue that remains self-reinforcing despite lack of evidence to support the claims, and illustrates the ways in which verification by witnessing necessarily draws on the broader attitudes and knowledges of those present. Disinterest in these circumstances is depicted as distinctly absent. Each new contribution echoes and expands upon the preceding one, increasing the absurdity of each trope with

every repetition. For example, the opening speaker's account of a war between the two armies, the Subvolvans and Privolvans, is taken up by his first interlocutor, and the former army are 'explained' as 'Arcadians' ('reputed / Of all the *Grecians* the most stupid' [103-4]) who were mysteriously 'translated' to the moon.²¹ This is then developed by a second who, having spotted the 'elephant', triumphantly declares its existence provides proof of the previous claims:

... since the mighty *Pyrrhus* brought
These living castles first, 'tis thought,
Against the *Romans*, in the Field,
It may an Argument be held
(*Arcadia* being but a Piece,
As his Dominions were, of *Greece*,)
To prove, what this illustrious Person
Has made so noble a Discourse on;
And amply satisfy'd us all
Of th'*Privolvans* Original. (135-144)

The sources for explanation here are the products of shared classical education: the 'painted Grapes' of tradition that scientific language had been called upon by 'To the Royal Society'

²¹ The idea of two moon-tribes is found in Johannes Kepler's *Somnium* first published in 1634, and is developed in John Wilkins' *Discovery of a New World: or, a Discourse tending to prove, that it is probable there may be another Habitable World in the Moon* (1640) that mixes, as Nicholson (1960) puts it, a 'mingled web and woof of old legend and new science' in which 'supernatural beliefs of the past ... were gradually giving way to the scientific realism of the future, but science itself was still shrouded in mysteries' (98). This 'mingled web' of discursive forms and modes of knowing is the Restoration space of experimental communication that I am attempting to demonstrate here. For discussions of the literary structures of Kepler's and Wilkins' texts, see Aït-Touati (2011).

to reject. Each subsequent contribution to the discourse accepts and builds upon the premises of the one preceding, producing a mode of self-reinforcing consensual witnessing that compounds error and justifies absurdity. This flatly rejects Cowley's assertion in the *Proposition* that 'popular and received Errours ... shall be evinced by tryal, and taken notice of in publick Lectures, that they may no longer abuse the credulous, and beget new ones by consequence or similitude' (38). Instead, the social interactions of the experimentalists, their shared knowledges and rhetorics, manufacture consent instead of putting error on trial. The interchangeability of their voices foregrounds the social and intellectual cohesion of the poem's Society: a gentleman's club where civility and consent provide the key to acceptance.²²

The attitudes of the Society scientists are also far from Cowley's disinterested ideal. The discovery gives rise to a frenzy of excitement: 'all the rest began t'admire, / And like a train from him took Fire / ... / Cry'd out, impatient to know what / The Matter was, they wonder'd at.' (37-42). Even before identification of the elephant, the knowledge that something has been found is enough to produce impatient enthusiasm. And the poem continually fans the flames of this rhetorical fire to make explicit the failure of impartiality. The rhetoric shifts decisively to evoke material gain as the members search for distinction and fame:

Meanwhile the rest had had a Sight
Of all Particulars o'th'Fight;
And ev'ry Man with equal Care,

²² For an account of the importance of 'civility' in the Society and Sprat's *History*, see Jarvis (2013).

Perus'd of th' *Elephant* his Share,
Proud of his Int'rest in the Glory
Of so miraculous a Story: (161-166)

The promise of 'Int'rest', the bonus each hopes to gain from his stake in the 'Story', enhances the lack of objectivity in the discourse as each person measure his investment ('his Share') in the miraculousness of the discovered object. Plans are laid to use the discovery to compensate for previous errors as it 'makes amends / For all our unsuccessful Pains / And lost Expense of Time and Brains.' (176-8) Disinterested witnessing, crucial for establishing 'matters of fact', is presented here as having been rendered impossible by the excited language and attitudes of the philosophers, and their 'investment' in finding something of value.

When one of the distinctly uninterested 'Footboys', who has 'nothing else to do' as the scientists speculate about the elephant, realises that 'A little Thing is slunk / Into the long star-gazing Trunk' (325-38), a single objective virtuoso ('one, / Who was not so far overgrown / In any virtuous Speculation, / To judge with mere Imagination' [341-4]) declares that a mouse has been caught in the telescope.²³ Rather than checking the speculation, however, this merely changes the focus of the dialogue: the interested consensus has become so crucial that it must be maintained, even at the expense of truth. One of the chief scientists (Bruun identifies him as Sir Robert Boyle [1969:388]) declares:

²³ The footboys are not persuasively read as the representatives of 'real' scientific disinterest in the poem; as Robinson points out: 'Although the footboys' common-sense makes them clearly preferable to the virtuosi, they footboys themselves do not represent normative method. They simply stumble upon the truth as a result of their "monkey ingenuity" (l. 331).' (1983: 2) The virtuoso 'Who was not so far overgrown' is certainly a counter voice to the others, but is unidentified (and probably unidentifiable) in the critical readings that focus on individual scientists as he is afforded less than twenty lines and does not have the social description or direct speech to make his point given to the other key characters.

As no great Act was ever done,
Nor ever can, with Truth alone;
If nothing else but Truth w'allow,
'Tis no great Matter what we do.
For Truth is too reserv'd, and nice,
T'appear in mix'd Societies (401-6)

This acknowledgement of the impossibility of truth in 'mix'd Societies' encapsulates the poem's depiction of the impracticality of experimental method in arriving at objectivity in such circumstances: if the establishment of fact rests on disinterested witnessing, such witnessing is incapable of putting aside its worldly investments and, because, 'The World ... never sets Esteem / On what Things are, but what they seem' (415-6), truth cannot be separated from interest either in the philosophers' club or even society more generally.

Despite their best efforts to put truth to one side and continue with their speculations, however, the discovery of the error leads inevitably to a breakdown of consensus and a cacophony of dissenting voices: 'But still, the narrower they pry'd, / The more they were unsatisfy'd, / In no one Thing, they saw, agreeing; / As if th'had sev'ral Faiths of seeing.' (459-62) The revelation that a mouse has been mistaken for an elephant throws into relief the instability of the observed object in the play of rhetoric produced by experimental communication: the lack of uniformity and the impossibility of disinterest in their discussions renders impossible the modes of legitimate witnessing required to establish fact, and this rejection of the models of knowing that supporters of the new science were

attempting to propagate is the backbone of the poem's satirical attack on natural philosophy.

The poem ends by drawing a moral lesson for the experimental philosophers:

*That those who greedily pursue
Things wonderful instead of true;
That in their Speculations chuse
To make Discoveries strange News;
And Nat'ral History a Gazette
Of Tales stupendous, and far-fet;
Hold no Truth worthy to be known,
That is not huge, and over-grown,
And explicate Appearances,
Not as they are, but as they please,
In vain strive Nature to suborn,
And, for their Pains, are paid with Scorn. (509-20)*

The practices of the protagonists are condemned 'with Scorn' for their gullibility and overly enthusiastic 'Int'rest' in their discovery, and the humour of the satire emerges from their exaggerated excitement and subsequent embarrassment, but in a similar manner to Cowley's ode, the moral epilogue (set off from the rest of the poem in italics to indicate a voice from outside of the world it presented) can only gesture towards a mode of knowing and communicating natural philosophical truths that the narrative itself has simply not depicted. The threat of self-interest haunts experimental investigation and witnessing in the

poem as the language in which they are communicated continually run the risk of magnifying knowledge into speculation and '*strange News*'. Thus, although it ends with a call for moderation and disinterested honesty reminiscent of the assertions of Sprat's *History*, there is no evidence of that, or any capacity for it, at any other point in the poem. The difficulty is that '*Discoveries*' made by the new experimental philosophy of the period are necessarily '*strange News*' to both scientists themselves and the public at large, and the language of these discoveries therefore appears predisposed to be received as '*far-fet*' and '*over-grown*'. Once again, just as with Cowley, the call for a disinterested language for witnessing cannot be limited to the laboratory but must be shared by society as a whole if the aspirations of the new science are to be met; the thrust of Butler's poem, though, is that there is no evidence such an aspiration can be met in the current climate of Restoration England.

In the absence of the mode of any straightforwardly direct and transparent language to communicate disinterested judgements of the sorts invoked by Cowley and Sprat, public judgements of the results of experimental philosophy would remain open to being sceptically dismissed as the stupendous conjurings of cliques of glory-hunting virtuosos attempting to pass off their mice as celestial elephants. Despite their best efforts of the new scientists and their supporters, however, such a language did not yet exist. And, as Butler's poem makes evident, this defined the conflictual space the discoveries of experimental philosophy continually found themselves occupying during the period. The struggle to establish natural philosophy as a legitimate mode of knowing the world during the seventeenth century was genuine, and it was a struggle to which literary writing made a vital contribution.

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